Antibiotic resistance, stewardship, and consumption

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Peter Collignon and colleagues[1] aim to improve understanding of global antibiotic resistance drivers by quantifying associations between antibiotic resistance and potential contributing factors. A recent systematic review including 565 studies primarily reporting patient-level data found that antibiotic exposure, underlying disease, and invasive procedures had the greatest evidence of being antibiotic resistance drivers.[2] Given the small evidence base for the role of community factors,[2] we fully concur with Collignon and colleagues about the importance of considering such factors in the spread of antibiotic resistance.[1] However, as the authors recognise, correlation does not imply causation—indeed, national meticillin-resistant *Staphylococcus aureus* rates strongly correlate with unfair play of national football teams.[3] Conversely, it would be a mistake to conclude that weak (or even inverse) correlation between antibiotic use and antibiotic resistance at the national level implies an absence of a strong causal relationship (appendix).

There are several limitations to using current global data. First, important between-country differences in the quality and representativeness of data are likely to exist. For example, blood cultures are less frequently taken in resource-poor settings than in resource-rich settings, and often only when patients do not respond to empirical therapy, leading to inflated estimates of resistance.[4] Moreover, in lower income countries, a substantial proportion of antibiotics used might come from informal providers and not appear in consumption data. Both factors would be expected to weaken associations between reported antibiotic use and resistance, and could lead to positive associations between governance and infrastructure and antibiotic resistance, even if these factors have no effect on antibiotic resistance.

Additionally, comparisons based on national-level data can be problematic, particularly when many countries have a sharp divide between subpopulations that overuse antibiotics and those that are without access. Patients lacking access to antibiotics are also less likely to have access to health-care facilities where blood samples are taken. Considering antibiotic consumption only on a national per capita basis could therefore considerably underestimate antibiotic consumption in subpopulations where resistance is being measured. Using a multivariable model will unfortunately not overcome such biases.

Finally, the analysis simplifies antibiotic use such that the matter of which antibiotic is consumed is not considered, which will have importance in terms of resistance development.[5] Combined antibiotic consumption measures might therefore not be optimal for determining the contribution of antibiotic consumption to resistance.

While we welcome the central conclusion of the study about the need for efforts to reduce the spread of antibiotic resistance in the community, we are concerned that fundamental limitations of the data could have led to an undervaluing of the role of antibiotic stewardship.

We declare no competing interests.

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See Online for appendix